Pseudotsuga menziesii / Quercus gambelii Forest

MAP CLASS	Douglas-fir / Gambel Oak Forest, Canyon Floor Complex
COMMON NAME	Douglas-fir / Gambel Oak Forest
PHYSIOGNOMIC CLASS	Forest (I.)
PHYSIOGNOMIC SUBCLASS	Evergreen forest (I.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen forest (I.A.8.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (I.A.8.N.)
FORMATION	Conical-crowned temperate or subpolar needle-leaved evergreen forest (I.A.8.N.c.)
ALLIANCE	*Pseudotsuga menziesii* Forest

CLASSIFICATION CONFIDENCE LEVEL Moderate

USFS WETLAND SYSTEM Upland

RANGE

Walnut Canyon National Monument

Douglas-fir / Gambel Oak Forest is a common association within the more mesic habitats at Walnut Canyon NM and its environs. This association was only found in side drainages at higher elevations and cooler north and east facing slopes of the southwestern section of the project boundary on Walnut Canyon NM and the Forest Service lands.

Globally

This *Pseudotsuga menziesii* forest association occurs in the southern Rocky Mountains and southwestern U.S. and is found on foothills, mountains and plateaus from Colorado to Trans-Pecos Texas, west to Arizona and Utah.

ENVIRONMENTAL DESCRIPTION

Walnut Canyon National Monument

This association occurs mainly on higher elevation sites from 1980-2130m (average 2,050m). All of the relevés occurred within side drainages on steep or gradual slopes ranging from 15-65% slope (average 50%) and with northern or eastern exposures.

Globally

This forest association occurs on mountains and plateaus from Colorado to Trans-Pecos Texas, west to Arizona and Utah. Elevation ranges from 1370-2870 m (4500-9400 ft). Stands are found along drainages, gentle to moderate lower and middle slopes, steep upper slopes and ridgetops. Aspects are variable. This forest occurs as both a non-obligate riparian community on the outer margins of riparian areas in desert canyons and steep draws, and as an upland forest forming extensive stands on typically north-facing hillslopes (southern aspects at higher elevations). Soils vary, but are often shallow and rocky, ranging from sandy loams to clay. The surface is generally largely covered with a thin layer of litter. Parent materials include fractured limestone, sandstone, basalt and andesite.

MOST ABUNDANT SPECIES

Walnut Canyon National Monument

Stratum	Species
Tree canopy	*Pseudotsuga menziesii*
Tall Shrub	*Quercus gambelii*

Globally

Stratum	Species
Tree canopy	*Pseudotsuga menziesii, Pinus ponderosa, Pinus strobiformis,*
Tall Shrub	*Quercus gambelii*

ASSOCIATED SPECIES
Walnut Canyon National Monument
Juniperus scopulorum, Pinus ponderosa (all occur with >5% cover)

Globally
Acer glabrum, Achillea millefolium, Amelanchier spp., *Arctostaphylos patula, Bromus* spp., *Carex rossii, Cercocarpus montanus, Festuca arizonica, Holodiscus dumosus, Juniperus deppeana, Juniperus osteosperma, Koeleria macrantha,Lathyrus lanszwertii* var. *leucanthus, Mahonia repens, Muhlenbergia montana, Muhlenbergia virescens, Paxistima myrsinites, Pinus edulis, Pinus ponderosa, Pinus strobiformis, Poa fendleriana, Prunus virginiana, Ribes cereum, Robinia neomexicana, Rosa woodsii, Symphoricarpos oreophilus, Thalictrum fendleri, Vicia americana*

VEGETATION DESCRIPTION
Walnut Canyon National Monument
Douglas-fir / Gambel Oak Forest total vegetation cover ranged from 41-75% (average 59%) with 28-62% absolute cover (average 45%) in the tree layer, 6-20% (average 10%) in the shrub layer, and 4-15% (average 9%) in the herbaceous layer. The total species diversity ranged from 12-30 species (average 23) within the 7 relevés sampled.

The tree layer was dominated by *Pseudotsuga menziesii* with 16-62% absolute cover (average 29%) with DBH ranging from 4-26 in (11-67 cm) (average 8 in/21 cm). *Juniperus scopulorum* and *Pinus ponderosa* may co-dominate or have high cover within this association; however, they never dominate the tree canopy. The shrub layer consistently was dominated by *Quercus gambelii* with 4-22% absolute cover (average 16%); however, it occurred within the ground and tree layer as well. DBH for the larger tree layer ranged from 4-12 in (11-31 cm) (average 6 in/16 cm). The herbaceous layer contained a variety of herbs and grasses including *Artemisia ludoviciana, Bromus ciliatus, Poa fendleriana, Ptelea trifoliata, Thalictrum fendleri, Valeriana arizonica,* and *Vicia americana.*

Globally
This association is characterized by a relatively sparse to moderately dense evergreen tree canopy dominated by *Pseudotsuga menziesii* sometimes with scattered large *Pinus ponderosa, Pinus strobiformis, Pinus edulis,* or *Juniperus* spp. (especially on drier sites). *Abies concolor* is typically not present. *Quercus gambelii* dominates both the subcanopy (tree form, if present) and the moderately dense tall-shrub layer that consists of dense clumps of oak. *Quercus gambelii* must have at least 5% cover, but there is frequently over 25%. At higher elevations, the *Quercus gambelii* are more tree-like and *Symphoricarpos oreophilus* will be present with significant cover in the short-shrub layer. At lower elevations, scattered *Pinus edulis, Juniperus osteosperma,* or *Juniperus deppeana* are often present. Other common shrub species depending on range may include *Acer glabrum, Arctostaphylos patula, Amelanchier* spp., *Cercocarpus montanus, Holodiscus dumosus, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Ribes cereum, Robinia neomexicana,* and *Rosa woodsii*. The generally sparse herbaceous layer is composed of mostly graminoids with scattered forbs, but ranges to moderately dense and diverse. Associated graminoids may include *Bromus* spp., *Carex rossii, Festuca arizonica, Koeleria macrantha, Muhlenbergia montana, Muhlenbergia virescens,* and *Poa fendleriana*. Common forbs include *Achillea millefolium, Lathyrus lanszwertii* var. *leucanthus, Thalictrum fendleri,* and *Vicia americana*. The shrub layer has equal or greater cover than graminoids. This open conifer forest transitions to *Quercus gambelii* woodlands in drier sites and at lower elevations.

CONSERVATION RANK G5

DATABASE CODE CEGL000452

MAP CLASSES
The association Douglas-fir / Gambel Oak Forest is represented by map classes Douglas-fir / Gambel Oak Forest (map code 16) and Canyon Floor Complex (map code 10).

This association has a broad distribution within two map classes: one occurring in more mesic habitat, Canyon Floor Complex, and one occurring in cooler rim and side drainage habitats, Douglas-fir / Gambel Oak Forest. The distinguishing feature between the Douglas-fir / Gambel Oak Forest and the Canyon Floor Complex is that the Canyon Floor Complex occurs within the more mesic Walnut Creek canyon bottom. The total area of Douglas-fir / Gambel Oak Forest within Walnut Canyon NM is 320 ac (129 ha) within 29 polygons and the total area in the park

environs is 120 ac (48 ha) within 13 polygons. The total area of Canyon Floor Complex within Walnut Canyon NM is 120 ac (48 ha) within 39 polygons and the total area in the park environs is 32 ac (13 ha) within 23 polygons.

COMMENTS

Walnut Canyon National Monument

Due to Walnut Canyon and the adjacent side canyons often having a narrow canyon bottom, it was difficult to distinguish unique occurrences of this association within the Canyon Floor Complex. Therefore, this association was mapped as part of the Canyon Floor Complex map class, when it occurred within the riparian areas.

Globally

Within the habitat type literature there are four phases mentioned: *Festuca arizonica* phase, *Holodiscus dumosus* phase, *Muhlenbergia virescens* phase (all defined by having at least 5% cover of both *Quercus gambelii* and the nominal species), and *Quercus gambelii* (typic) phase by a undeveloped herbaceous layer (Alexander et al. 1984, Alexander et al. 1987, DeVelice et al. 1986, Fitzhugh et al. 1987, Johnston 1987, Larson and Moir 1987, Muldavin et al. 1996, Stuever and Hayden 1997b). There are 3 similar NVCS *Pseudotsuga menziesii* associations that use these phase species as the nominal species. These phases represent "intermediate" vegetation. Review of these associations is needed to clarify relationships between associations.

DYNAMICS

Globally

This association represents mid- to late-seral forests that are dominated by *Pseudotsuga menziesii* with the diagnostic *Quercus gambelii*-dominated understory. Large, often fire-scarred *Pinus ponderosa* trees may be present to codominant in the canopy, but do not reproduce (Alexander et al. 1984, DeVelice et al. 1986).

REFERENCES

Alexander et. al. 1984, Alexander et. al. 1987, Bader 1932, Blackhawk Coal Company 1981, Bourgeron et. al. 1993, Bourgeron et. al. 1995, Bourgeron and Engelking 1994, Devalice et. al. 1986, Diamond 1993, Fitzhugh et. al. 1987, Freeman and Dick-Peddie 1970, Hess and Wesser 1982, Johnston 1987, Keammerer 1974, Kittel et. al. 1994, Kittel et. al. 1999a, Kittel et. al. 1999b, Kamarakova et. al. 1988a, Kamarakova et. al. 1988b, Larsen and Moir 1987, Muldavin et. al. 1996, Stuever and Hayden 1997b, Tiedeman and Terwilliger 1997b, Western Ecology Working Group of Nature Serve, Youngblood and Mauk 1985

Note:

This association is found in two different map classes:

1) Canyon Floor Complex
2) Douglas-fir / Gambel Oak Forest